Research Report 1240

USING PREDICTOR EQUATIONS TO ASSESS POTENTIAL PERFORMANCE OF ARMOR ENLISTEES

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This review examines research findings on predicting the performance of armor crewmen and shows how these findings may be applied in the current training program. Performance measures from two research efforts were combined and examined as a function of various levels of predictor test scores. The predictors were based on selected subtest scores from the Armed Services Vocational Aptitude Battery (ASVAB), which is administered to all enlistees. The performance scores were based on hands-on performance of specific armor

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crewman tasks. The results of various methods of assigning groups of enlistees to training programs illustrate the effects of different decision rules on the end-product of training. With the method of prediction supplied in this review, the performance potential of groups of enlistees may be assessed from readily available test scores, and the result of assigning these individuals to different training programs may be estimated. This method could result in more efficient use of the human resources.

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USING PREDICTOR EQUATIONS TO ASSESS POTENTIAL PERFORMANCE OF ARMOR ENLISTEES

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Predicting Armor
Crew Performance

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FOREWORD

A major research area for the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) is performance-oriented individual training. The ARI Field Unit at Fort Knox, Ky., in its work unit area "Individual Readiness in Armor Training and Performance" (Army Project 2Q162722A766), is concerned with improving methods used to assign personnel to training and service in tank crew duty positions. The long-range program includes developing and validating predictor tests to improve assignment practices and thus enhance tank crew combat proficiency.

This report demonstrates the usefulness of predictor equations and shows how to use them in assigning tank crewmen to duty positions of tank commander, gunner/loader, and driver on the basis of objective measures of their aptitudes and performance. ARI Technical Report 391 described the development and initial validation of these predictors, which used subtests from the Armed Services Vocational Aptitude Battery (ASVAB), other selected paper-and-pencil tests, and interim training performance measures; ARI Technical Report 447 describes their cross-validation. The project was designed in response to requests by the USA Armor Center and the USA Armor School.

JOSEPH ZEIDNER
Technical Director

USING PREDICTOR EQUATIONS TO ASSESS POTENTIAL
PERFORMANCE OF ARMOR ENLISTEES

BRIEF

Requirement:

To examine the findings of research on predicting the performance of armor crewmen and to show how to apply these findings in the current training program and the present configuration of enlistee capabilities.

Procedure:

Performance measures from two research efforts were combined and examined in relation to selected subtest scores from the Armed Services Vocational Aptitude Battery (ASVAB), which is administered to all enlistees. The performance scores were based on hands-on performance of specific armor crewman tasks. The results of various methods of assigning groups of enlistees to training programs illustrate the effects of different decision rules on the end-product of training.

Utilization of Findings:

With this method of prediction, the performance potential of groups of enlistees may be assessed from readily available test scores, and the result of assignment of these individuals to different training programs may be estimated. The overall effect of this method can be the more efficient use of the human resources currently available to the armor community through the existing recruiting program.

USING PREDICTOR EQUATIONS TO ASSESS POTENTIAL PERFORMANCE OF ARMOR ENLISTEES

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USING PREDICTOR EQUATIONS TO ASSESS POTENTIAL PERFORMANCE OF ARMOR ENLISTEES

INTRODUCTION

Until January 1978, training for tank crewmen had been a general course of familiarization with driving, loading, and firing a tank. A newly graduated trainee arrived at his unit of first assignment ready to occupy whichever tank position was vacant, the driver's or the loader's. The Tank Forces Management Group recommended that the basic armor training program be changed, effective January 1978, so that specialized training was given for each tank position. Under this program, the graduate trainee is either a qualified loader/gunner <u>or</u> a qualified driver.

The purpose of this change was to put a trained and combat-ready crewman in the field on the first day of his assignment, thereby avoiding a period of limited usefulness during extensive on-the-job training to learn specific skills. The effect of this change, however, not only reduced the individual training required in the field, but it also completely changed training concepts at the 1st AIT/OSUT Brigade, Armor, Fort Knox, Ky. Replacing the previous single program of instruction for all trainees are two more specialized programs. In addition, and most important to the purpose of this report, a decision that had been made in the field after the soldier had received dual training must now be made in the Reception Station before training: Should this soldier be a gunner/loader or a driver? When made in the field, this decision could consider the needs of the acquiring unit, the success the soldier had during initial training, and his own assignment preference. When this decision must be made in the Reception Station, such bases of information are unavailable, and other sources of data for decisionmaking must be found.

At the time of the training change, the Army Research Institute (ARI) was developing a method to help field commanders choose the best qualified persons for driver, gunner, and tank commander positions (Greenstein & Hughes, 1977; Eaton, 1978; Eaton, Bessemer, & Kristiansen, 1979). Because ARI researchers were developing a series of prediction equations, it was decided to use the yet unproven predictors to choose trainees for the differential training programs and to cross-validate the predictors using the first 10 companies receiving the reconstituted basic armor training. The cross-validation results were reported by Maitland, Eaton, and Neff (1980).

Briefly, the Maitland et al. research found two equations, one that validly predicted the performance of gunner/loader trainees and one that predicted the performance of driver trainees. Since the purpose of the Maitland et al. study was to cross-validate the findings of earlier work, the researchers did not address the usefulness of the findings. This report, therefore, reviews the findings of that research, simplifies the prediction equations, and demonstrates their usefulness to the Army.

The specific objectives of this report are (a) to review the findings of the cross-validation research with the gunner/loader and driver predictor formulas, (b) to demonstrate the usefulness of the predictors, and (c) to provide a simple method of computation as well as methods for using the predictors in decisionmaking.

PREVIOUS PREDICTOR RESEARCH

Cross-Validation of Predictor Formulas

Maitland, Eaton, and Neff (1980) reported the successful cross-validation of two predictor formulas: one for drivers and one for gunner/loaders. The effective predictor of driving performance was labeled Driving UMO, which stands for driving predictor based on unit-weighted model (UM) omitting additional tests (O). The calculation of Driving UMO requires five subtest scores, which are readily available for new recruits, from the individual's Armed Services Vocational Aptitude Battery (ASVAB). The five subtest scores used are Numerical Operations, Arithmetic Reasoning, Electronics Information, Automotive Information, and Classification Inventory--Electronics. To compute Driving UMO, each score is standardized before summing in order to weight each equally despite unequal standard deviations in the subtests. Gunnery UMO is the gunnery predictor based on unit-weighted model (UM) omitting additional tests (O) and is computed as the sum of standardized scores from these ASVAB subtests: Word Knowledge, Mathematics Knowledge, and Mechanical Comprehension.

Using a sample of 130 individuals trained as drivers, Maitland et al. reported a validity coefficient of .28 between Driving UMO and driving performance. Gunnery UMO showed a validity coefficient of .29 with gunnery performance in a sample of 205 persons trained as gunner/loaders. Both results are statistically significant at the .01 level.

Included in the Maitland, Eaton, and Neff results (without discussion) are the validity coefficients for two other predictors, which are easier to compute than Driving UMO and Gunnery UMO and are equally effective. These predictors are called Driving UMS and Gunnery UMS and represent the same subtest scores as the UMO versions, but allow summation without standardization. The UMS (unit-weighted model--simplified) predictors, although less elegant statistically, are easier to compute and are preferred for field application of the predictor formulas. Driving UMO and Driving UMS were seen to correlate at the .97 level with one another, while the validity coefficient for Driving UMS with driver performance was .28 (the same as Driving UMO). Gunnery UMO and Gunnery UMS correlated at the .99 level, and Gunnery UMS had a validity coefficient of .30 with gunner performance. The use of Driving UMS and Gunnery UMS as predictors for field use is clearly indicated.

Although a validity coefficient is statistically useful in establishing a reliable relationship between two variables, it does not indicate how that relationship may be exploited. This report will demonstrate the relationship between the two predictors and their performance criteria and specify a method for applying the predictors differentially.

Predictor-Performance Relationship

The test results from two separate projects were considered. Eaton, Bessemer, and Kristiansen (1979) tested 130 trainees who were trained as both drivers and gunner/loaders and were tested on both the driving course and the gunner Table VI. Maitland, Eaton, and Neff (1980) tested 130 trainees on the driver course and 205 trainees on the gunner Table VI. By standardizing the course scores within groups, scores could be made

comparable across groups and, by combining the groups, the overall sample size could be increased. By combining the groups for which driver scores were available, a total of 250 driver course scores and almost 300 gunner Table VI scores resulted (some data sets were incomplete).

For trainees in the combined sample, the mean driver predicted score (Driving UMS) was 35, with a standard deviation of 10. The mean gunner/loader predictor score (Gunnery UMS) was 75, with a standard deviation of 15. Using this information, each group could be divided according to each individual's predictor scores with respect to the group's mean and standard deviation on that predictor.

The first sorting of individuals was done according to their gunner/loader predictor scores. Four categories of Gunnery UMS were initially used: more than one standard deviation below the mean; less than one standard deviation below the mean; less than one standard deviation above the mean; and more than one standard deviation above the mean. Each group was further divided into four groups based on the individual's predicted score in the driver course (Driving UMS).

Since many cells of the resulting 4 x 4 matrix held few individuals, cells were combined in a way that would best represent the data. Table 1 presents the results of this combination. The first number in each cell represents the mean of standardized scores (z scores) for the gunner course attained by the trainees whose predictor scores placed them in that category. The second number represents the number of scores making up that mean. The next pair of numbers is the same treatment used for driver course scores. The numbers outside the cells indicate the range of values of Gunnery UMS and Driving UMS that define the makeup of the cells.

Interpretation of the mean z scores in the matrix rests on the fact that if a population of performance scores with a mean of zero were randomly distributed into the matrix, the mean of the scores in each cell would be close to zero, with minor and random differences. The results shown in Table 1, however, indicate large and systematic differences in performance scores. The systematic nature of the scores can best be appreciated by recasting the table as shown in Table 2. Table 2 combines the first two cells of Table 1 into predictor category 1.

Keeping in mind that scores of zero represent average performance and that the signs represent direction of deviation from average while the magnitude of the number represents degree of deviation, certain facts become clear. Members of the first category (0-34 on Gunnery UMS and 0-75 on Driving UMS) were not very good gunners or drivers. Members of Category 2 were average gunners but poor drivers. In Category 3 (0-34; 76-110) the members were average gunners but above-average drivers. The fourth category (Gunnery 35-110; Driving UMS 76-91) contained good gunners but better drivers. Category 5 contained trainees who were well-above-average gunners and well-above-average drivers.

The clarity of these relationships and the fact that they are based on two large samples of trainees, chosen at different times and experiencing different training techniques, lend strong support to the expectation that selection of trainees for differential training based on the data presented would lead to similar results.

Table 1

Mean Standardized Gunnery and Driving Performance as a Function of Gunnery and Driving Predictor Scores

<table>
<tr><th></th><th></th><th colspan="4">Gunner/Loader Predictor: Gunnery UMS</th></tr>
<tr><th></th><th></th><th colspan="2">0-34</th><th colspan="2">35+</th></tr>
<tr><th></th><th></th><th>GNRCRS</th><th>DVRCRS</th><th>GNRCRS</th><th>DVRCRS</th></tr>
<tr><td rowspan="4">Driver Predictor: Driving UMS</td><td>0-60</td><td>-.33 (37)</td><td>-.42 (19)</td><td rowspan="2">-.06 (49)</td><td rowspan="2">-.28 (43)</td></tr>
<tr><td>61-75</td><td>-.23 (77)</td><td>-.31 (57)</td></tr>
<tr><td>76-91</td><td rowspan="2">-.03 (25)</td><td rowspan="2">.25 (30)</td><td>.14 (65)</td><td>.29 (51)</td></tr>
<tr><td>92+</td><td>.43 (36)</td><td>.48 (49)</td></tr>
</table>

Source: Eaton, Bessemer, and Kristiansen (1979); Maitland, Eaton, and Neff (1980).

Table 2

Estimates of Potential Performance for Enlistees in Predictor Categories Based on Gunnery UMS and Driving UMS

Predictor category	Range of predictor scores		Potential performance	
	Gunnery UMS	Driving UMS	As gunner	As driver
1	0-34	0-75	Poor (-.28)	Poor (-.36)
2	35+	0-75	Fair (-.06)	Poor (-.28)
3	0-34	76+	Fair (-.03)	Very good (.25)
4	35+	76-91	Good (.14)	Very good (.29)
5	35+	92+	Excellent (.43)	Excellent (.48)

Table 2 represents the best current estimate of potential performance for groups of trainees. These estimates of performance potential may be used to form the basis of a decision rule for the assignment of individuals to training programs in which their potential will be maximized. Clearly, trainees in Category 2 would be of greater value to the Army if they became gunners rather than drivers. Trainees in Categories 3 and 4 would make better drivers than gunners. It is, however, less clear what to do with individuals in Categories 1 and 5. An assessment of Army needs, and proportion of trainees falling into each group, was undertaken to provide information toward an assignment decision rule.

METHODS OF COMPUTATION

Current Assignment Method

In January 1979 an experimental method of assigning trainees to differential training programs at the 1st AIT/OSUT Bde, Armor, Fort Knox, Ky., was instituted. Based on incomplete data from the Maitland et al. (1980) research, the method required providing the Reception Station with a table for computing a driver predictor and a gunner predictor for each enlistee. Assignment to training program was then made on the basis of (a) which score was highest and (b) need for gunner/loaders or drivers as determined by the appropriate military command.

Predictor scores and training program assignment information were available for the first eight training companies formed during calendar year 1979, representing a total of 1,057 trainees. Table 3 gives the breakdown of those trainees by predictor categories and training assignment.

Assuming that the data in Table 3 are representative of the distribution of predictor scores among Army enlistees under the current enlistment program, and that the assignment to training programs is representative of the Army's needs in the near future, certain outcomes may be projected from various decision rules on the assignment procedure. For purposes of illustration, a

random assignment procedure and the current assignment procedure will be used. In Table 4, percentages of available enlistees are indicated as falling into predictor categories based on the data in Table 3. The "random assignment" option portrays the percentage of enlistees who would be assigned to gunner/loader or driver training based on the approximately 70%/30% split found to be the current Army practice. The next column restates the percentage of available enlistees entering the training programs under the current procedure.

Table 3

Distribution of Trainees in First Eight Training Companies by Predictor Category and Training Program Assignment

Predictor category	No. of trainees	No. assigned to be gunner/loaders	No. assigned to be drivers
1	452 (43%)	380 (36%)	72 (7%)
2	106 (10%)	98 (10%)	8 (0%)
3	145 (14%)	67 (6%)	78 (7%)
4	176 (17%)	117 (11%)	59 (6%)
5	178 (17%)	73 (7%)	105 (10%)
Total	1,057	735 (70%)	322 (30%)

Note. All percentages are of total number of trainees.

Table 4

Comparison of Two Methods of Assigning Enlistees to Training Programs

Predictor category	Percentage of enlistees in this category (from Table 3)	Random assignment % gunner	Random assignment % driver	Present rule % gunner (from Table 3)	Present rule % driver (from Table 3)	Potential as Gunner (from Table 2)	Potential as Driver (from Table 2)
1	43	29	13	36	7	Poor	Poor
2	10	7	3	10	0	Fair	Poor
3	14	10	4	7	7	Fair	Very good
4	17	12	5	11	6	Good	Very good
5	17	12	5	7	9	Excellent	Excellent

Table 4 shows that under a purely random assignment procedure, 3% of the enlistees would be assigned as drivers even though their potential for that position is poor (Category 2). The random assignment scheme would place 14% of the Category 3, 4, and 5 enlistees (those with driver potential in the very good to excellent range) into driver training. Under the present decision rule, very few enlistees from Category 2 become drivers while a larger percentage of Categories 3, 4, and 5 become drivers (22% versus 14%). With full knowledge of the relationship between predictor scores and performance outcomes, rational decisions can be made concerning the assignment of enlistees to training programs. The current method is an improvement over a random assignment procedure, but other decision rules are possible.

Hypothetical Decision Rules

A simple decision rule--designated Decision Rule A--for the assignment of trainees to training programs would be as follows: Assign Categories 2, 3, and 4 to the programs for which they are best suited and use Categories 1 and 5 randomly. This procedure would give the results shown in Table 5. Decision Rule A can be seen to result in an almost even split between the training programs, with 51% of trainees becoming gunner/loaders and 49% becoming drivers. Clearly, this procedure is not consistent with the needs of the Army as shown in current experience, where a 70%/30% split exists. To correct the imbalance of Decision Rule A, another rule is offered and its ramifications discussed.

Table 5

Comparison of Two Additional Methods of Assigning Trainees to Training Programs

Predictor category	Percentage of enlistees in this category (from Table 3)	Decision Rule A		Decision Rule B		Potential as	
		Gunner	Driver	Gunner	Driver	Gunner (from Table 2)	Driver (from Table 2)
1	42%	29%	13%	42%	0%	Poor	Poor
2	10	10	0	10	0	Fair	Poor
3	14	0	14	0	14	Fair	Very good
4	17	0	17	0	17	Good	Very good
5	17	12	5	17	0	Excellent	Excellent
Total		51	49	69	31		

Table 5 shows the results of assigning all Category 1 and 5 trainees to gunner/loader training under the heading "Decision Rule B." Use of this rule results in a distribution of enlistees entering the differential training programs in a proportion that is very close to the present needs of the Army. In Categories 2, 3, and 4, all enlistees are placed in the program for which they are best suited. The gunner/loader program can be seen to be receiving all the poor potential enlistees of Category 1 and all the excellent potential enlistees of Category 5. This result can be defended when one considers that the poor potential gunners of Category 1 will have an opportunity to remain loaders during their early Army careers (thereby not becoming poor gunners, which was predicted). The excellent potential gunners of Category 5, on the other hand, will have the chance to become gunners during their first enlistment and also have the chance to become tank commanders early in their Army careers. Although these individuals may have become excellent drivers, it may be argued that (a) their contributions as gunners will be greater than as drivers; (b) the opportunities for advancement without retraining will be greater as gunner/loaders; and (c) there are sufficient "very good" drivers under this decision rule to make up for the loss of several "excellent" drivers.

The two hypothetical decision rules are described here to illustrate the usefulness of the data analysis to the policymaking command that must decide how to allocate best the Army's resources. The analytic method provided by the research cited in this review measured the resource potential inherent in the enlistees arriving at the Reception Station and provided a means of using that measure.

Computing the Predictors

Computation of the gunner/loader and driver predictors may be accomplished by anyone who has the ASVAB subtest scores available. Since the ASVAB is administered prior to induction into the Army, the predictors could be computed before the individual completes the enlistment contract. Since the predictors would be needed at the training company, they could be computed at any time between initial testing and the first day of training.

All that is required for computation is the summation of several raw scores. For the gunner/loader predictor (Gunnery UMS), the raw scores added together would be Word Knowledge (WK), Mathematics Knowledge (MK), and Mechanical Comprehension (MC). For the driver predictor (Driving UMS), the raw scores for the following are summed: Numerical Operations (NO), Arithmetic Reasoning (AR), Electronics Information (EI), and Classification Inventory--Electronics (GC-CE).

The resulting sums are then located in the range of predictors to identify the predictor category:

Gunnery UMS	Driving UMS	Predictor category
0-34	0-75	1
35+	0-75	2
0-34	76+	3
35+	76-91	4
35+	92+	5

The final step is to assign members of particular categories to training programs in accordance with the decision rule mandated by the needs of the Army.

SUMMARY AND CONCLUSIONS

As indicated in the preceding tables, each performance predictor category is associated with particular values of tank driving and gunnery performance potential. Depending upon the decision rule adopted, the majority of high-potential enlistees can be assigned to either type of training, and the effect on the other duty position's pool of potential enlistees may be immediately assessed.

The methods presented in this report are seen as providing a tool for decisionmaking authorities. This tool allows assignment of enlistees to be maximized within a broad range of conditions, at no additional cost to the government beyond the cost of distributing the table of category assignments.

REFERENCES

Eaton, N. K. Predicting tank gunnery performance. ARI Research Memorandum 78-6, February 1978.

Eaton, N. K., Bessemer, D. W., & Kristiansen, D. M. Tank crew position assignment. ARI Technical Report 391, 1979.

Greenstein, R. B., & Hughes, R. G. The development of discriminators for predicting success in armor crew positions. ARI Research Memorandum 77-27, December 1977.

Maitland, A. J., Eaton, N. K., & Neff, J. F. Cross-validation of predictor equations for armor crewman performance. Technical Report 447, January 1980.

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